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PREHISTORIC DEMOGRAPHY
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Prehistoric demography is central to the solution of many problems of the past. It studies the conditions in which prehistoric people reproduced themselves, and in this sense it is crucial for an understanding of how genetic mechanisms worked in particular situations.

I am going to explain prehistoric demography putting much weight upon archaeology, i.e. the study of artefacts. As I try to make my presentation fairly exhaustive, I have to abstain from going into details and using examples. As demography is largely a product of what is often termed culture, it varies from region to region and from period to period. There is nothing such as "prehistoric" demography, for there are many prehistoric demographies. This must be always kept in mind.

My personal interest is in the prehistory of Central Europe that is unusually rich in the archaeological record. There are thousands of sites consisting mostly of the remains of graveyards, villages and/or other activity areas, many of them containing a wealth of finds that can be classified with the chronological accuracy of something like a century. Archaeological remains are densely distributed in space. Two contemporaneous sites frequently lie at a distance of less than 3 kilometres. This is unusual elsewhere.

In my view most questions of prehistoric demography can be solved in principle. However, many archaeologists have not yet paid enough attention to the methodological aspects of the problem that renders their work very difficult to use. Studies identifying the number of houses found in a village with the number of families living in the village in the past are still common. Therefore, I shall pay much attention to methodological and theoretical questions.

Prehistoric demography develops according to two lines of research. The first line is occupied with the *structure of prehistoric populations*, for example with the relationships between the number of men and women in their reproductive period, their life expectancy, the index of masculinity etc. Nearly all this can be derived from the so-called life tables. The role of biological (physical) anthropology in the solution of these questions is very important.

The second line of research in prehistoric demography concerns the problems of *the reproduction of prehistoric people*. This field of demographic concern covers for example the questions of population increase or decrease, of the size of population groups, and of a possible non-biological intervention into human reproduction. The role of prehistoric archaeology is crucial for this kind of enquiry.

There are two research strategies by means of which prehistoric demography can be reconstructed on the basis of the archaeological evidence:

1. by considering the evidence contained in human skeletons excavated by archaeologists
2. by considering the artefacts created by ancient people.

I shall now briefly discuss the two methods.

1 The evidence of skeletons

Skeletons are usually excavated, spatially documented and dated by archaeologists, but the expertise that leads to demographic knowledge cannot be realised without physical (biological) anthropology.

The logic of the method used is simple: one can reconstruct most demographic parameters of any population simply by determining the sex and age of individual skeletons from a cemetery. The formulae needed for this purpose were derived in the 17th century by the English astronomer Halley during his visit of Wrocław in Silesia. Halley's method can be easily applied to archaeological finds once anthropologists classify the skeletons as to their age and sex. The result is life tables consisting of demographic functions such as the probability of death at age x, the relative number of survivals at age x, and the life expectancy at age x. However, Halley's calculations cannot reveal any measure of natural increase and there is no simple way to determine the rate of natural increase on the basis of skeletons themselves.

There are several obstacles to a straightforward application of the Halley method:

1.1.1. The problem of stationarity

The first of them is the problem of *stationarity* that is often supposed to be the most severe limitation of the application of the method in archaeology. The main cause of complications is supposed to be the fact that ancient populations may not have been stationary, i.e. their natural increase was possibly not zero. This might be a major problem, because Halley's method for the calculation of life tables is based on the supposition of stationarity. It can be demonstrated on other grounds, however, that prehistoric populations were stationary *on the average* while the actual rate of increase could have been slightly positive or negative. It can also be demonstrated that even if strict stationarity were not met, minor rates of natural increase would hardly disturb the life tables calculated by the Halley method to a major degree.

1.1.2. The problem of completeness

The second obstacle is the fact that prehistoric burial grounds are mostly *incomplete* in the sense that *large groups of population may have been interred elsewhere* than in the formal cemeteries from which the Halley life tables are calculated. We now have enough evidence in Central Europe, for example, that all prehistoric groups beginning with the Neolithic period buried some of their dead in deserted or half-deserted villages. This habit, for which we have so far no explanation, was widespread, but difficult to quantify. We do not know how many persons are missing from the regular cemeteries and how people were selected for this or that kind of burial.

What is even worse, *children up to the age of 3* are missing almost entirely everywhere despite the fact that the mortality in this age group must have been considerable. This makes it very difficult to calculate some of the functions of the life tables. If full scale life-tables are needed, some of the values must be reconstructed.

The incompleteness of the archaeological record is certainly more important for the evaluation of prehistoric demography than the possible, but probably not very real, problem of stationarity.

1.1.3. The age of skeletons

One of the most severe limitations is the fact that physical anthropologists cannot determine *the age of skeletons* with sufficient accuracy. The sex of the deceased can be sometimes decided on the basis of archaeological consideration and recently also by means of molecular methods, but the age remains quite a problem. Several decades ago physical anthropologists were still more optimistic about determining the age of adult skeletons setting them to 5 year or 10 year intervals, but nowadays many are more sceptical. Some anthropologists replace the empirically observed values by means of theoretical constructions of a dubious nature.

As an archaeologist I cannot discuss this in any detail, but I can point to the fact that

- the raw empirical data mostly generate fully acceptable life tables. They are acceptable in the sense that individual age groups are in the proportion expected by independent evidence such as the medieval series.
- Also, the life tables reconstructed for the prehistoric period by the Halley method show somewhat worse demographic parameters, such as lower values for the life expectancy function, than life tables reconstructed for the medieval period on the basis of the written record.

This shows that our knowledge of the ageing of skeletons may not be so bad after all and that the life tables based on it need not lack sense.

1.1.4. The size of sample populations

There is another limitation to demographic reconstructions based on ancient skeletons, which is rarely considered. This is the *size* of sample populations. While modern demography has mostly no problems of principle with overcoming random variations because it can easily observe thousands of people, prehistoric samples are mostly small: several dozen or several hundred skeletons, usually less than five hundred. Because the conservation of bone in graves is frequently unsatisfactory, many of them do not contain remains from which their age and sex could be determined. This makes the number of usable skeletons even smaller. Archaeologists cannot go and excavate larger cemeteries because they do not exist: prehistoric communities that left the cemeteries were small or medium sized.

Another factor influencing the situation of the record is the fact that in many regions of the world prehistoric populations *moved quite frequently* (over the period of several decades, possibly remaining at one place for less that 200 years); usually they also moved their graveyards without leaving any indication where the next cemetery of the same community lies.

2 The evidence of artefacts

The logical basis for the use of artefacts in demographic research lies in the fact that *the number of artefacts depends on the number of persons that produced and used them*. The number of houses may be in a proportion to the number of families, and the number of ”sites” in proportion to the number of communities. Moreover, a growing population produces a growing number of artefacts, and in this way artefacts reflect the rate of population growth.

All this seems to be so obvious that a number of archaeologists take the testimony of artefacts at its face value believing, for example, that more houses in an archaeological

context indicate a larger village of the past, and more sites imply a greater density of population. It is a common belief that if a later period produces more sites than the previous one, it means a population increased over time. However, all these assumptions can be demonstrated to be invalid in principle.

I shall soon discuss the methodological problem of how the quantity of the archaeological record changes. To approach this issue critically, we have to realize that the archaeological record as found by archaeologists (the ”dead” culture) substantially differs from the living culture of the past. It is sometimes believed that this difference can be reduced to the fact that, in contrast to the living past, the archaeologically recovered artefacts are static and some of them are missing; for example those made of perishable materials. The reality, however, is more complicated.

A series of processes changes the living culture radically, transforming it into the archaeological record. I shall refer to these processes as *transformations.* Some of the transformations are purely qualitative (such as the disintegration of shape) while others influence *the quantity of artefacts*. Transformations represent the archaeological parallel of taphonomy. I believe, however, that the theory of archaeological transformations can be defined more exactly. I shall pay attention to those transformations that change the quantity of artefacts, as only by fully realizing them can archaeologists properly draw consequences in the sphere of demography.

The transformations are as follows: fragmentation, reduction, and accumulation. I am going to shortly discuss them mainly from the point of view of their impact upon the reconstruction of ancient demography.

2.1.1. Fragmentation

Most artefacts appear in the archaeological record in the form of fragments of which only a part is accessible to archaeological research. Typically, pottery vessels disintegrate into sherds each original vessel being usually represented by a few fragments. Another example of fragmented artefacts is a few houses (sometimes incomplete) that represent a prehistoric village. The remaining houses are not accessible because they have been either destroyed by erosion or not yet excavated. This kind of fragmentation has a direct effect upon demographic considerations.

2.1.2. Reduction

Most archaeological artefacts are dramatically reduced in their numbers. The measure of reduction is not the same for all kinds of artefacts; it depends on the material from which it is made as well as on the environment to which the artefacts get after their exit from the live culture. Some artefacts are reduced almost to zero (e.g. wooden objects or most textiles), while others survive almost one hundred percent (e.g. stone tools). Most rates of reduction lie in between zero and one hundred. There are reasons to believe that more than 95 per cent of prehistoric pottery sherds and/or animal bones are destroyed in the soil of Central Europe. It is important for demographic considerations to note that villages built entirely above the ground leave no traces, and barrows with interments deposited at the level of the surrounding terrain can be entirely erased from the record by subsequent ploughing.

2.1.3. Accumulation

Many archaeologists do not suspect the existence of this kind of transformation that can severely change the quantitative relations among artefacts. The essence of this transformation is connected with the concept of the life span of artefacts, i.e. the average duration of its use or ”life”. If the life span of a pottery plate is one year, and the life span of an amphora is ten years, the quantitative relation in the living culture may be one amphora to one plate at any moment, while the relationship of broken vessels in an archaeological site will be one hundred plates to ten amphoras after a century.

Let us consider an excavated Bronze Age village, lasting 80 years, with 16 house plans recovered by excavations. If the life span of a house is 20 years on the average, it can be easily calculated that the average number of houses at the site at any moment was 4.

$$P=(R*z)/t \quad P=(16*20)/80=4$$

It is obvious that the number of house remains in nearly any archaeological site must be much higher than the number of houses used by the past living population at any point of the past. The same logic applies to all kinds of artefacts.

3 Some results

So far, some of you may have obtained the impression that the reconstruction of prehistoric demography is very difficult if not impossible. I tried to point out the many difficulties mainly to demonstrate that demography is not a matter of simple narration in present day archaeology. But notwithstanding the difficulties we can say much that is positive about the demography already now.

3.1 Population size in prehistoric times

One of the most frequently discussed problems of prehistoric demography is *the number of inhabitants* in a territory. If the size of the territory is known, absolute numbers change into relative values expressing the *density*.

The standard method used in such cases consists of three steps:

(1) the assessment of the *number of people living in one average house*

(2) the assessment of the *number of houses in one average village*

(3) the assessment of the *number of villages in a region*.

If these parameters are known, the number of inhabitants of a region is simply obtained by multiplying the three values enumerated above with each other. This procedure, however, requires some comment.

3.1.1. The number of people living in one house

Most archaeologists assume that each house was inhabited by one *nuclear family*, with possibly a few other people joining temporarily.

It can be assumed, mainly on the basis of the study of prehistoric life tables as well as on the basis of ethnographic models that nuclear families were often joined by single old people of the preceding generation who did not form any new family any more after

widowing for the last time, and possibly by young people, mostly orphans, who have not yet married. Families that expanded in this way can be termed households; on the average they may have added less than one average person to nuclear families.

It is often assumed, on the basis of parallels with biblical families, with the situation in modern Third World countries, and with European families of the 19th century, that prehistoric nuclear families must have been large, something like 6 people on the average, or even more. Some 20 years ago, I derived a formula for the approximation of the number of people per one nuclear family on the basis of life table parameters (this formula in fact calculates the number of people per one female in the reproductive age). Alternative calculations based on the function c_x show almost identical results: prehistoric nuclear families could hardly have exceeded 4 persons *on the average*. In consequence of this households represented less (often much less) than 5 persons on the average.

The assumption of something like 6 people per one average nuclear family can be shown to lead to a very fast overpopulation of any region. In consequence of this, archaeologists have to give up their intuitive guesses based on unreasonable parallels.

3.1.2. The number of houses in a village

The problem of counting houses of an archaeologically-uncovered site seems to be extremely simple to many archaeologists. They just count the house plans found per one typological period or one stratigraphical layer and then extrapolate the results to the whole site (as the site is rarely excavated in its completeness).

One typological phase at a site – as well as one stratigraphical unit – may easily last several decades and possibly many decades. In contrast to this the mean life time of a prehistoric house is most probably less than the time span of the occupation of the site, possibly less than 20 years. This makes it clear that all the houses whose plans are found at a site could not have stood there at the same time.

Also, not all the houses that stood in a village at one time were permanently occupied by a family or a household. The number of houses derived from archaeological excavations represents a quantity accumulated over time. In addition to the technology used as well as with other factors such as the type of agriculture, the life span of a prehistoric house could also have been influenced by purely "irrational" reasons of symbolic nature.

The average number of inhabitants of one village can also be calculated from the number of graves in a (complete) cemetery using the life tables, here again under the condition of the stationarity of the population. It can be obtained from a simple formula:

$$P = D\, e^o / t$$

where P is the average number of inhabitants at any time, D is the number of skeletons in the cemetery, e^o is the life expectancy of a new born, and t is the number of years over which the cemetery was used. If we take, as a model example, D = 200 (skeletons), e^o = 28 years (which corresponds to the death rate of approximately 3.5 %) and t = 350 years, we get

$$P = 200*28/350 = 16 \text{ persons.}$$

This means either 4 nuclear families or, more realistically, something like 3 households. The parameters used in this example correspond approximately to the largest cemetery of the Corded Ware (or Battle axe) culture in Central Europe and in this way it can serve as a standard for many other prehistoric culture groups.

Obviously, we can play with the equation. Accepting a higher death rate (which is the reciprocal of life expectancy), the resulting live population will shrink further. D and t are more or less observed values and they cannot be easily manipulated. However, D may in fact be larger because of a part of the population "missing" in the regular cemeteries. It is obvious that even in doubling D, it is unlikely to get anything like large population groups.

3.1.3. The number of villages in a region

It is well known that various culture groups occupying the same territory and lasting approximately the same number of years produce a radically different number of archaeological sites. This phenomenon is most frequently explained by the unequal number of inhabitants in those periods, i.e. by significant fluctuations in the population density over time.

The number of sites from two succeeding periods of prehistory may easily differ by the factor of ten or more.

There is no doubt that the variation in the density of sites can hardly be explained by changing densities of the prehistoric population, but rather by the transformation of the archaeological record. The large number of sites is usually caused by an accumulation of objects that have a very short life span (such as the late Bronze Age storage pits, for example) while the reduction transformation is responsible for the deficiency of sites.

There emerges the problem of some regions and some periods of prehistory that remain almost without any archaeologically visible record in spite of the fact that prehistoric people did live there at that time. Imagine a region (such as southern Bohemia, for example) where subsurface prehistoric features are rare and the average sloping of the terrain is high. In such a case the refuse areas that usually supply most finds will normally be carried away by erosion and there will be no or very few intrusions into later layers. To prove the presence of all culture groups would be very difficult indeed. This is even more so if no subsurface features were dug in some of the culture groups for symbolic reasons while others had no such limitations. In fact, methods for discovering components of prehistoric settlement areas missing for these reasons have not yet been developed.

The measure of reduction is tremendous as can be demonstrated by means of so-called *intrusions* of individual artefacts, mostly fragments, in later subterranean objects: a whole eneolithic village representing several decades of life can be reduced to one or two sherds scattered in the fill of a late Bronze Age storage pit. Therefore, the study of intrusions is becoming one of the most powerful tools in considering prehistoric demography.

3.1.4. Conclusions

It remains to briefly discuss the results on the size of populations. I would like to point out, here again, that demographic issues cannot be studied in a way other than in a regional context. What I am going to present is valid for many parts of prehistoric central Europe and even for the rural population of the Middle Ages. The basic parameters can be summarized in the following table:

	persons	families/households
average family	<4	
average household	<5	
village	12 to 30	3 to 6

density*	3 to 5 persons per sq.km. of the community area	approximately 1

I have to briefly comment on the problem of the density of the prehistoric population which is often, even if misleadingly, calculated in relation to modern territorial units. Although some regions seem to have been occupied densely with almost no gaps in between the individual community areas, there were other regions, mainly mountainous, with virtually no prehistoric settlement. The number of people obviously cannot be related to the latter type of regions.

Therefore I tentatively approximate the density of prehistoric population by relating the average number of persons per village to the average size of its community area. The preliminary result of such calculations is included in the table.

3.2 The settlement structure in prehistoric Central Europe

In prehistoric Central Europe we are in the happy situation that we have detailed evidence for the spatial distribution of at least some periods and some regions. This does not mean that we can reconstruct the full settlement network, but we assume that regional fragments of it are known in some cases.

In all well documented situations, the picture is the same: small villages situated quite close to each other, usually spaced from one to three kilometres. All archaeological sites of one culture group need not have been fully contemporaneous, but many of them certainly were. Adjusting for the former cases, the density would become less, but it would still remain high.

Therefore, the general rule seems to be small villages densely distributed in small distances. There are exceptions to such rules.

3.3 The rate of increase

The biological potential of humans is tremendous. It is only slightly weakened by the generally high death rate that did not allow the whole reproductive period of women to be exploited for the purpose of reproduction. However, something like a yearly increase of 3% was fully realisable; there is no reason to believe that such values of natural increase could not be achieved in prehistoric times. However, these or even much smaller positive values of natural increase, if made real, would cause enormous overpopulation mainly due to the vast time depth of prehistoric times.

The following table approximates the factor by which the original population multiplies in a given number of years:

years	growth rate		
	1%	2%	3%
50	1.6	2.7	4.5
100	2.7	7.4	20.1
200	7.4	54.6	403
300	20.1	403	8103

This table displays, for example, that the original population of 100 persons increases to more than 800 000 over 300 years if its growth rate is 3%.

There are three models according to which the situation of rapid growth can be explained.

1. One of them relies on the supposition of unlimited ”natural” growth followed by the emigration of the excess population.
2. The second solution allows the population to fluctuate: to grow for some time (possibly up to the carrying capacity of the area) and then to be reduced either by emigration or by some violent event, disaster, famine etc.
3. The third method is the installation of measures for preventing any population growth.

The first two models assume the existence of areas in which the population grows over time prior to its emigration. However, archaeology can document no such areas. All the examples of which I am aware are heavily influenced by the transformation of the archaeological record, mostly by reduction and accumulation. The observed increase or decrease of the number of graves, pits, or sites in general can be explained by ritual peculiarities, the digging of subsurface hollows or, conversely, by building everything above the ground, and/or by the differential life span of archaeological features. Also, there are no areas where the excessive population could go after growing to unbearable dimensions, because since the developed Neolithic period, prehistoric farmers densely occupied most regions in Europe. Around 4500 BC there was an unanticipated movement of the European population colonizing the southern part of Scandinavia and the British Isles, previously occupied by Mesolithic cultures, but this does not seem to be the consequence of an overpopulation prior to the advance of the colonization wave.

In consequence of this, the third solution gains credibility: the prehistoric people apparently knew how to limit their growth by manipulating their sexual behaviour by social and ideological means, and possibly by supplementing such measures by infanticide. Otherwise they would overpopulate periodically, rapidly and in many regions at the same time. Such an overpopulation could not escape the attention of archaeologists.

3.4 The problems of migrations

Migration is a recognized concept of traditional demography. Surprisingly, its opposite, i.e. the continuity of population is rarely studied, apparently because it is considered to be the rule. In fact, both the concepts are extremely important in prehistoric demography.

3.4.1. Migrations as population discontinuity

Although the culture historical paradigm, ruling archaeology for most parts of the 20th century, proposed migrations to be one of the main causes of events in prehistoric times, its adherents never suggested any demographic instrument by means of which it could occur. The almost exclusive explanation was overpopulation in some selected regions ensuing from unspecified natural factors.

Migrations, however, are conditioned by demographic processes and, at the same time, they deeply influence the biology of human populations.

Migration has rarely the form of population movement in which the migrating groups simply transfer themselves to a new area, leaving the area of their origin empty. Thus

migration is almost always connected with a measure of population increase and often also population decrease to balance it. Because the means by which people manipulate their reproduction are social and ideological, it is more or less easy to install them almost immediately. Therefore, it seems to be simple to migrate at any time. Similarly to stop the higher natural growth after the migration presents no difficulty in a situation when there is no more any necessity to fill new territories with population.

The generally accepted assumption that migration results from overpopulation leads to the widely accepted conclusion that the growth came first and the movement of the population followed. In theories such as the wave of advance, the growth might have occurred at the same time as the movement, but this obviously slows the process down.

Some time ago I suggested that migration need not have taken place in this way. It can be imagined that the spread of the migrating population occurred *before the natural growth*. This possibility was not considered by those anthropologists who believed in the purely natural causation of population growth. Small groups consisting of individual families or very small groups of families would penetrate into the newly colonized territories, not keeping the usual pattern of distances between two neighbouring villages. This would allow for a much faster occupation of new territories, while the sparsely distributed population could grow subsequently in the next several decades. It can be calculated that the ”normal” population density would be restored over a time interval that is shorter than what archaeological chronology is usually able to grasp. Thus, such demographic events would not be observed easily by archaeological means.

It is obvious that this kind of migration would have an impact upon the genetics of the migrating population because the whole population would originate from a rather restricted set of persons.

The model ”movement first, growth later” could have taken place during the *colonization* of Europe by farmers at the beginning of the Neolithic period. Colonization takes place in territories with sparse or no previous settlement, and for this reason the local population, if there was any, would not represent any major obstacle for the migrants. *Expansion*, in contrast to colonization, is directed into regions that were previously fully settled. In that case the earlier local population would have to be removed. If this were done, for example by exterminating it, the situation would be the same as in the case of any colonization. However, I am not aware of any prehistoric example of such an expansion.

With the exception of the colonization by which the agricultural stage of prehistory begins, there are in my view few archaeological examples of large scale long distance population movements preceding the Iron Age. This may have been caused by the many difficulties that any migration of larger groups of population of the Bronze Age type brings about. The problems begin with practical issues such as how to till fields in the first year of migration, how to feed the stock of domestic animals, and goes on into the social sphere (how to restore the networks of trade through which bronze was supplied, how to restore the networks by which marriages were concluded etc.). Also, there must have been problems how to mentally appropriate the landscape, including the possibly dangerous objects such as graveyards of the earlier population.

In the Eneolithic period and in the Bronze Age the prehistoric community still formed a unique body that could not easily separate. In the Iron Age, however, it seems that the leading layers of the population could break away from the community by going away to replace the leading layer of another community. This process created the form of movement that I describe as *invasion*; it was typical of population groups of the developed Iron Age and later.

The pre-processual archaeology recognized many instances of the mixing of the older, local population with the newcomers. This mixing was assumed in the shapes of vessels, in

the form of pottery decoration, and in the formal attributes of various artefacts. It was later recognized that virtually all this mixing of artefacts never took place. It seems that the mixing has become fashionable again, this time on the basis of the genetic evidence.

3.4.2. The continuity of artefacts

I shall very shortly explain why and how archaeologists are able to articulate their views on the continuity of populations on the basis of their own records, i.e. on the basis of artefacts. I would start with the generally accepted opinion that human groups reproduce not only genes but frequently also language. Without going into details, I would like to draw your attention to the fact that by creating artefacts people generate, in addition to language, yet another body of symbols and signs. We communicate by means of a particular aspects of our artefactual culture such as clothing, weapons, grave ritual etc., as nearly any artefact has some sort of symbolic significance which is able to convey information.

Artefacts also have what I call their *expressive aspect*. It is composed of those formal attributes of artefacts that have neither a practical function nor a communicative significance, but the simply express something. For example, the way in which the surface of a pot is treated cannot be considered to have a practical function already in view of the many possibilities of how the task can be done. Also, it does not contain any message. People treat the surface of pots in the way that is usual, customary, and/or common in their culture, just to express regularity, consistency, stability and the like. If they did it otherwise, they would violate their own group identity, as any deviation from what is usual would be considered to be a symbol which communicates a message. Prehistoric artefacts contain lots of expressive properties that simply express the usual. It can be assumed that many attributes that originally had a symbolic significance later lost it almost entirely and became expressions of identity. For example, the spiral on Neolithic pottery may belong to this class.

3.4.3. Cultural versus biological continuity

Archaeologists, mainly those in Central Europe, were acutely aware of the importance of the stability of human culture especially since the end of the 19th century. It was mainly on the basis of the continuity in the communicative and the expressive aspect of culture that they divided prehistory into many archaeological cultures or culture groups. We should be aware of the fact that the groups are real and they become important when we study the dynamics of human populations. From the point of view of time changes, archaeological cultures become manifestations of continuity.

I would like to draw attention to these facts especially in this session, as cultural continuity is often forgotten when considering the inheritance of ancient populations. Cultural continuity is not identical with genetic continuity, but it is still continuity, and the two frequently coincide in concrete instances. There is a number of reasons why they are not identical, but the main factor is undoubtedly the fact that by creating artefacts, human beings make themselves free of natural inheritance. From the point of view of artefacts, even people with completely different genes may become closest relatives. This is not to say that archaeologists are not eager to obtain detailed knowledge of biological heredity that helps solve a number of archaeological questions in addition to solving biological issues.

It seems to me – but as an outsider in biology I may be mistaken – that natural science has frequently been about species or about at least groups of individuals. However, by means of molecular biology, natural scientists get a tool for considering individuals. Archaeology has much experience with the study of individual events, their observation, description,

systemization and explanation; there is much danger in doing all this. Therefore we are looking to the point in time when there will be some genetic information about more individuals from each population to see the variability.

3.5 The non-biological intervention into demography

The case of population growth clearly demonstrates that prehistoric people were able to manipulate demographic processes with full success. In fact, any kind of migration was only feasible if people were able to release the rules imposing limits on their natural growth at the beginning of the migration and reintroduce it afterwards. The regional variability of the size of prehistoric communities occupying more or less the same ecological zone demonstrates that human demography was not a natural process. The same ensues from the fact that the size of populations settling the same region often differed in two subsequent periods. Also, the types of migrations are clearly socially determined.

The *rapid changes over time and space* such as can be observed in the human world do not seem to have parallels in nature. The situation that human populations change their culture substantially over several decades or over the distance of several ten kilometres is common.

We are unable to observe the *causes* of human incursions into the ”natural” system of demographic relations in prehistoric times. It is almost certain that prehistoric people did not consider the demographic processes in terms of the discipline of demography, but their considerations had some ideological cover. Thus, demographic processes were cognitive but, for example, we cannot assume that we could come to the true reasons for the incompleteness of prehistoric cemeteries even if we had the possibility to ask ancient people. However, what archaeologists frequently can do is observe the results. In other cases we suspect that something went on that has no parallel in our modern life, but we are still unable to go into details.

3.5.1. The irregular behaviour

Irregularity in human behaviour can often be traced through the observation of cultural continuity and/or discontinuity. There are several large scale discontinuities in the archaeology of Central Europe.

One of them, an almost absolute one, came at the beginning of the Neolithic period shortly after 5500 BC. The Mesolithic cultures, which up to that date occupied the region, developed into groups such as La Hoguette, found as far to the east as the Stuttgart region; this group is so much unlike the Linear Pottery culture of the colonists coming from the south-east that any inherent link between them is out of question. The character of the contacts between the two types of population remains unclear.

Another discontinuity is between the middle Eneolithic period in Central Europe and the subsequent Corded Ware or Battle Axe culture. The middle Eneolithic period houses a number of formally divergent groups such as late Baden, Řivnáč, Cham, Horgen, Globular Amphora, Walternienburg-Bernburg and late phases of the TRB culture. All this diversity disappears some time between 2900 and 2800 BC, and is replaced by a rather uniform early phase of the Corded Ware culture. This represents a complete rupture with the past: pottery, stone tools, personal ornaments, types of weapons, and the burial rite are all new and

typologically incomparable to the middle eneolithic culture groups. There are very few links between the two archaeological periods, most of them of a general nature.

These empirically observed facts became known at the beginning of the 20th century and nearly everybody believed that they were a consequence of a demic expansion or invasion from outside Central Europe. It was believed that the Corded Ware had lived together with the earlier population of the middle Eneolithic type in the same landscapes. The assumed population movement was frequently connected with the arrival of the Indo-European speakers.

This explanation by means of large scale migration has now become difficult to support. Both absolute and relative chronologies demonstrate that what happened was a sudden replacement of culture over distances of thousands of kilometres. The long lasting contemporaneity of the Corded Ware with the middle Eneolithic period, as assumed earlier, could not take place on chronological grounds. But what is even more significant is the fact that detailed archaeological research in the surrounding countries showed that there was no region in Europe from which the Corded Ware culture could have come.

There is no solution other than that the Corded Ware culture originated in Central Europe (plus possibly in southern Scandinavia), the change of culture being a point of discontinuity lasting not more than several decades. We have no theoretical model describing how this could have happened.

We know, however, that the Corded Ware culture was extraordinary in many other respects. Its grave ritual was strict as to the position of the dead (depending on sex), to the position of artefact classes in graves, to the differential equipment of graves with artefacts in dependence on sex and age etc. While there are several hundred cemeteries in Bohemia, not a single storage pit or a dwelling dug under the surface has so far been recovered. There are some 1500 graves in Bohemia, but not a single one contained the large simple pot with a wavy ribbon under the rim that characterizes the places where Corded Ware people lived (apparently on the surface). Often I express the situation with the words that Corded Ware people were fundamentalists.

We still do not know what happened in Central Europe in the first half of the 3rd millennium BC. It is even more disquieting that a similar history repeats in the second half of the millennium with the Bell Beaker culture. This group does not reach into eastern Europe and Scandinavia, but it is found in western Europe and even in some places of northern Africa. This time the discontinuity of culture is matched by the discontinuity of biological attributes, as one part of Beaker skulls found in Central European are brachycephalic and there are also other peculiarities.

Archaeologists feel that there is continuity between the Bell Beakers and the preceding Corded Ware but, here again, convincing evidence is missing. The presence of the Bell Beaker culture in many parts of western Europe remains a mystery – unless we accept the simplistic explanation that everything happened by means of migration.

Looking at these two topics of archaeology in Central Europe from the demographic point of view, I have to state that the model ”migration first, growth of population later” could possibly explain it. Better yet, I should say that it cannot be excluded on the basis of present-day evidence.

These people were undoubtedly our ancestors in the sense of cultural continuity. We are beginning to feel that their behaviour was not like ours. If their artefact production was unconventional, their demography, including reproduction, could also be likewise.

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